Stroop Effect

By Nitish Dhiman

1. What is our independent variable? What is our dependent variable?

The **independent** variable is the congruent/incongruent condition test. The **dependent** variable is the time taken to identify the congruent/incongruent words.

2. What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.

μ_c **-** Population mean results for a congruent Stroop test.
μ_i **–** Population mean results for an incongruent Stroop test.

Null Hypotheses (H_0): No difference between the time taken to name the colours in congruent and incongruent condition.
$\mu_c = \mu_i$ i.e, $\mu_c - \mu_i = 0$

Alternative Hypotheses (H_a): There is a significant difference between the time taken to name the colours in congruent and incongruent condition.
$\mu_c - \mu_i \neq 0$

Statistical Test

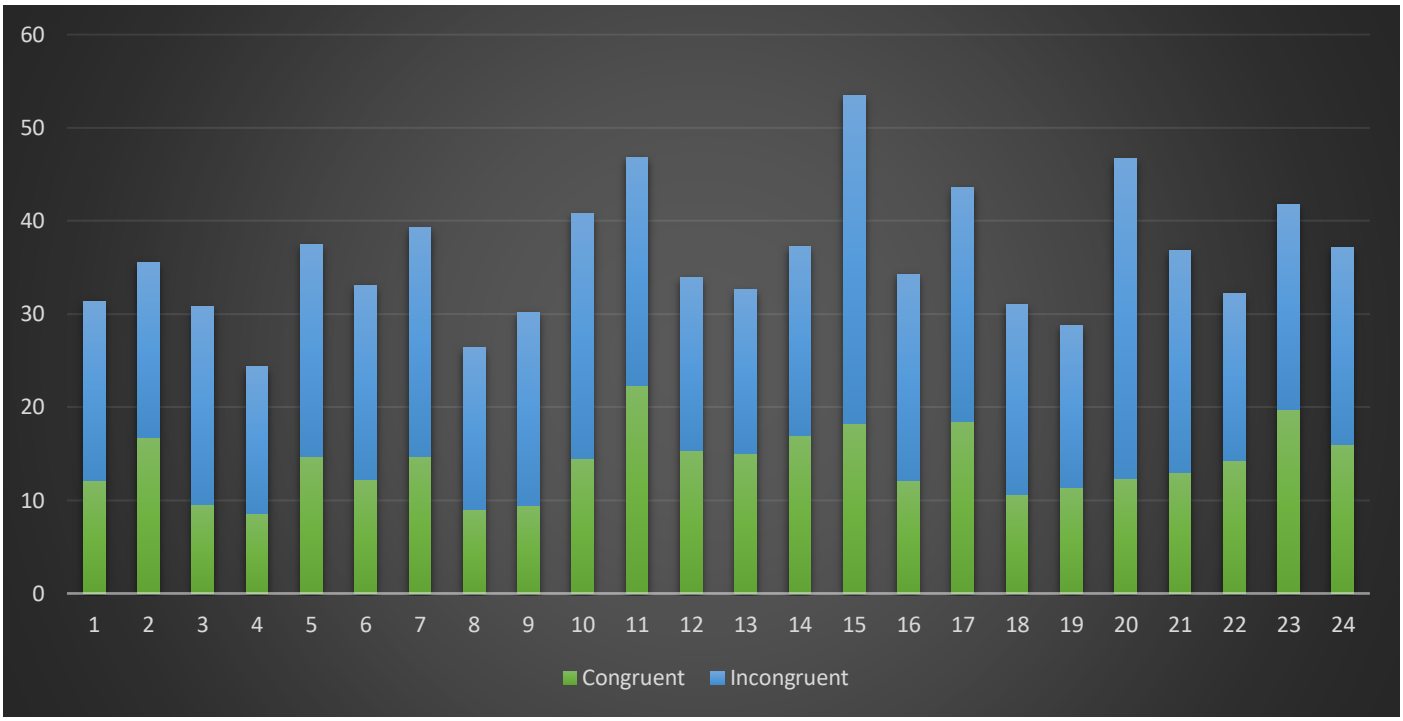
I except to perform a t-test within-subject since the population parameters are not provided and the same subject take the test twice i.e. the people who took the congruent words condition also took the incongruent words condition. Therefore, I can say that the a Dependent t-test needs to be performed.

3. Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.

Central Tendency	Congruent Condition	Incongruent Condition
Mean	14.05	22.01
Median	14.36	21.02

Measure of Variability	Sample
Variance	23.67
Standard Deviation	4.86

4. **Provide one or two visualizations that show the distribution of the sample data. Write one or two sentences noting what you observe about the plot or plots.**



This 2-D stacked column chart represents the comparison between the congruent and incongruent values and there seems to be delay to complete the incongruent word test in comparison to the congruent word test.

5. **Now, perform the statistical test and report your results. What is your confidence level and your critical statistic value? Do you reject the null hypotheses or fail to reject it? Come to a conclusion in terms of the experiment task. Did the results match up with your expectations?**

The calculations are done on the basis of a **Two – Tailed Test** at an α level of 0.05.

Confidence Level (95%)	-10.01, -5.93
T-Critical Value	+/-2.0690
T- Statistic	-8.02071
R^2	0.737
Cohen's d	-1.637
p-value	< 0.05

Using the above information, I **reject the null hypotheses (H_0)** because out t-statistic value is much beyond the t-critical value and we see that $p < 0.05$.

I come to a conclusion that people take more time in Incongruent test that in Congruent test because in the congruent words condition, the words being displayed are colour words whose names match the colours in which they are printed and hence making it easier to say out loud the colour of the ink and reducing the time.

In case of Incongruent test, the words displayed are colour words whose names do not match the colours in which they are printed and as a result making it difficult to say out loud the colour of the ink in which the word is printed and hence taking more time that congruent test.

Yes, the results did match up to my expectations as the time between the congruent and the incongruent condition cannot be the same and hence, we **reject the null hypotheses**.

6. Optional: What do you think is responsible for the effects observed? Can you think of an alternative or similar task that would result in a similar effect? Some research about the problem will be helpful for thinking about these two questions!

According to me we as habitual readers encounter and comprehend words on such a persistent basis that the reading occurs almost effortlessly, whereas a declaration of a colour requires more cognitive effort including tasks (preventing reading, processing word colour, and resolving information conflict in our brain) which ultimately slows down our responses, and makes the task take longer.

An Alternative to the Stroop Colour Word Test for illiterate individuals denominated the Coloured Numbers Test which involves to name the colour of the rectangles in the neutral condition, and in the critical condition they had to either name the colour of the numbers or when the numbers were black, read the numbers. The advantage of this test over the traditional test is that illiterate individuals can easily take this test.

References

Stroop effect: https://en.wikipedia.org/wiki/Stroop_effect
Colour-Word Test (Alternative to Stroop Test): https://imotions.com/blog/the-stroop-effect/